



Research Article

**DETERMINATION AND TOXICOLOGICAL EFFECTS OF METALS ON HUMAN SKIN BY
USING HAIR REMOVING CREAMS AND LOTIONS BY SPECTROSCOPIC TECHNIQUES**

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Abstract: Hair removing creams and lotions are known as chemical depilatories. Its function to degrade a keratin protein present in the hairs. Calcium hydroxide and potassium thioglycolate are present in the hair removal products. When these chemicals are united it dissolves keratin proteins which form a hair strand and weaken body hair at its root. Toxic metals have no known function in the body but their existence in cosmetic play a vital role. Some toxic metals are present in hair removal products make user skin red, aggravated even blacken the skin. It caused hormonal cancer, sexual problems and rashes on sensitive parts of the skin. For the precautionary measure of user, it is necessary to find out the toxic metals which are present in different brands of hair removal products by Atomic Absorption Spectroscopy (AAS) and Inductive Couple Plasma (ICP).

Keywords: hair removing creams, hair removing lotions, Toxic metals, AAS, ICP-AES

Introduction

The presence or absence of body hairs are allied to social norms in each culture of human society. In many countries removal of the female body hairs are well thought-out to proper hygienic.¹ Metals are played vital role for living organisms as well as in cosmetic. In this ear people become more modernized especially women wears shorter dress and swimsuits due to this fact increase in the practice of removing unwanted body hair such as on legs, underarms and elsewhere. In the European countries, women are habitually shaving their legs and armpits in majority, some women also shave their bikini lines on the daily bases.²

For aesthetic or sexual reasons people may also remove some or all of their public hair. For human beings hairs are very beneficial like in the ear to protect from in some external insecticides etc and for nostrils to protect from dust particles. Public hairs are present on head, eyebrows, eyelashes, arms and legs in both men and women but men have thicker hair on their face, abdomen, back and chest.³

Epilation or depilation is recognized as hair removal methods. Hairs on top of the surface of skin are removed by depilation technique including creams, lotions, shaving powder or friction in which breaking the disulfide bonds that associated through protein chains. In epilation method including waxing, sugaring, epilation devices, lasers, threading, intense pulsed light or electrology are used to removed hairs. The hair removal products contain a few different alkaline chemicals, such as sodium thioglycolate, strontium sulfide and calcium thioglycolate that react with the hairs on the body. Depilatory creams and lotions are containing toxic chemicals. The alkalis that dissolve hairs can cause allergic reactions, skin inflammation, minor burns, lesions, scarring, ingrown hairs, bumps, infected hair

follicles, irritate and burn the skin. By the Food and Drug Administration (FDA), Eflornithine is secure method to remove facial hairs but it is not actual a hair remover, its function to decreases the rate of hair growth.⁴

Laser technology is utilized to remove hairs permanently. It is worked by sending energy into the pigment of the hair shaft.⁵ This energy is absorbed by the hair follicle and hair construction stops. The laser attacks more than one follicle at a time.⁶ In current years equipment for performing laser hair removal at home has become available.⁷ Permanent hair reduction including methods photoepilation, laser hair removal, intense pulsed light or diode epilation.⁸

Experimental Section

Total of 10 different brands of hair removal products of different manufacturing companies had been collected. The present study was quantified the amount of toxic metals in hair removing creams and lotions. One gram weighed sample was placed in digestion flask then 20 mL concentrated nitric acid was added. The digestion flask was heated at 70°C to 80 °C on a hot plate for 30 minutes. At the end 5 mL of H₂O₂ was added in the flask when solution was cooled and heated vigorously till the white fumes appeared and mixture volume was reduced to 2-3 mL.

After digestion of the sample, 20 mL of the sample solution was passed through the microcolumn which was prepared by MWCNT⁵ with a peristaltic pump at a flow rate of 2.0 mL/min. The retained ions were eluted with concentrated HNO₃ from the column. Then the eluted toxic metal ions were analyzed by ICP-AES. Blank solution was prepared without adding the sample.

Results and Discussion

The amount of toxic metals Cu, Cr, Co, Ni, Pb and Zn are present in hair removal products shown in Table-1 by AAS. The concentration of toxic metals such as As, Bi, Cd, Hg and Pb are present in hair removal products as shown in Table-2 by ICP-AES.

Toxic metals present in hair removal products are damage the skin and caused different problems like hormonal cancers, birth defect, rashes and infections. In

some cases by frequent uses it can cause skin color darken which looks very unsightly. According to FDA standard limit for toxic metals are present in hair removal products $<0.3 \mu\text{g.g}^{-1}$. By AAS analysis, Cr is present in most of the hair removal products beyond the FDA standard limits. In hair remove powder (A4) Cu, Cr and Zn are present above the standard limit of FDA. In A4 sample of hair remove powder is contained Cd and Hg above WHO standard by ICP-AES analysis.

Table 1-Concentration of Toxic metals in different brands of Hair removal products by mean \pm standard deviation ($\mu\text{g.g}^{-1}$)

Sample Code	Cu	Cr	Co	Ni	Pb	Zn
A1	0.047 \pm 0.008	0.317 \pm 0.004	0.028 \pm 0.007	0.252 \pm 0.01	0.081 \pm 0.007	0.227 \pm 0.009
A2	0.079 \pm 0.007	0.295 \pm 0.008	0.014 \pm 0.014	0.256 \pm 0.008	0.064 \pm 0.009	0.259 \pm 0.006
A3	0.119 \pm 0.008	0.218 \pm 0.006	Nil	0.365 \pm 0.026	0.143 \pm 0.007	0.318 \pm 0.004
A4	0.519 \pm 0.007	0.334 \pm 0.012	0.085 \pm 0.011	0.095 \pm 0.012	0.193 \pm 0.013	0.524 \pm 0.009
A5	0.116 \pm 0.004	0.229 \pm 0.009	0.019 \pm 0.008	0.166 \pm 0.007	0.089 \pm 0.007	0.585 \pm 0.009
A6	0.079 \pm 0.006	0.287 \pm 0.012	0.019 \pm 0.007	0.336 \pm 0.01	0.119 \pm 0.004	0.523 \pm 0.008
A7	0.031 \pm 0.007	0.293 \pm 0.013	0.023 \pm 0.01	0.239 \pm 0.008	0.085 \pm 0.009	Nil
A8	0.081 \pm 0.009	0.347 \pm 0.008	0.019 \pm 0.007	0.238 \pm 0.011	0.015 \pm 0.01	0.188 \pm 0.006
A9	0.076 \pm 0.008	0.495 \pm 0.01	0.01 \pm 0.01	0.08 \pm 0.007	0.038 \pm 0.01	1.226 \pm 0.009
A10	0.118 \pm 0.008	0.356 \pm 0.009	0.018 \pm 0.007	0.226 \pm 0.01	0.071 \pm 0.006	0.434 \pm 0.011

Table 2-Toxic metals content present in Hair removal products ($\mu\text{g.g}^{-1}$)

Samples Code	As concentration	Bi concentration	Cd concentration	Hg concentration	Pb concentration
A1	1.476 \pm 0.001	4.761 \pm 0.004	0.081 \pm 0.002	2.613 \pm 0.003	3.136 \pm 0.0015
A2	6.97 \pm 0.02	4.522 \pm 0.003	0.791 \pm 0.0025	BDL	1.335 \pm 0.002
A3	5.62 \pm 0.015	BDL	0.498 \pm 0.002	BDL	3.60 \pm 0.312
A4	2.12 \pm 0.03	BDL	0.345 \pm 0.003	1.649 \pm 0.003	1.14 \pm 0.025
A5	4.94 \pm 0.03	BDL	0.234 \pm 0.002	BDL	1.56 \pm 0.015
A6	2.39 \pm 0.02	5.95 \pm 0.015	0.119 \pm 0.003	3.68 \pm 0.041	2.18 \pm 0.032
A7	2.70 \pm 0.04	2.11 \pm 0.03	0.217 \pm 0.002	BDL	1.16 \pm 0.035
A8	2.21 \pm 0.04	BDL	0.315 \pm 0.003	0.44 \pm 0.015	2.35 \pm 0.023
A9	3.48 \pm 0.01	BDL	BDL	0.21 \pm 0.040	1.64 \pm 0.020
A10	1.99 \pm 0.032	0.59 \pm 0.025	0.089 \pm 0.002	0.39 \pm 0.030	0.37 \pm 0.02

BDL= below the detection limit

Conclusions

Hair removing creams and lotions are worked by chemically affecting the individual hair strands. The function of hair removal products is entered deeper into hair follicle and destroys the keratin. Toxic chemicals that break the bonds of the hairs can cause inflammation, rashes, sting a lot and irritation in some sensitive skin. So for the awareness of the user Cosmetic companies must mention the amount of toxic metals present in hair removing creams and lotions Hair removing creams and lotions have erratic amounts of toxic metals ignoring the WHO standard. After reckless use these brands may cause different types of allergies particularly in sensitive hidden parts of the body. These creams and lotions are also tarnish the skin and blacken the sensitive parts which look very unsightly especially for women. There are also probability for skin cancer and hormonal disorder. So for the safety of user care must be taken for prolonged use of these hair removing creams and lotions to avoid the toxic effects of the metals.

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